This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

Tec 2055.10

Mechanics
[illegible]

Harvard College Library

THE GIFT OF

SAMUEL ABBOTT GREEN, M.D.,

OF BOSTON.

(Class of 1851.)

2 June, 1887.

~~VI, 4643~~

REPORT

ON

ENGLISH COTTON MILLS AND METHODS.

BY

EDWARD ATKINSON.

AT A MEETING OF THE
NEW ENGLAND COTTON MANUFACTURERS'
ASSOCIATION,

HELD IN BOSTON, MASS., OCTOBER 31, 1883.

BOSTON, MASS.:
JOURNAL OF COMMERCE PUBLISHING COMPANY.
1883.

~~VL 4643~~
Tec 2055.10

HARVARD COLLEGE
JUN 2 1887
LIBRARY.

Dr. S. A. Green,
Boston.

REPORT.

Mr. Atkinson began by saying: I never before so much regretted my lack of real technical and practical instruction in cotton spinning as in my recent visit to England. I should never have dared to bring before you what I am now to present, had I not made a partial report to the directors of the company of which I am president, a copy of which falling into the hands of one of your executive officers, led to an urgent request, to which I have submitted. If I bore you, it is their fault, not mine. It is not so ponderous as it seems, (laughter), as I will skip a good deal of it.

Having spent the last part of my recent stay in England. in Yorkshire and Lancashire, inspecting mills and machine shops, I observed many differences between English and American practice, a statement of which may be of some use. I venture to express no opinions upon these differences, because it is some years since I was directly engaged in manufacturing, and also because my observations were of necessity somewhat superficial. You will take them for just what they are worth.

The first cotton mill visited was the mill of Messrs. Bowman Bros., at Halifax. These gentlemen own about 150,000 spindles, which are operated on medium and fine yarns, spun from Orleans, Memphis and Egyptian cotton. A picture of their mill is submitted herewith.

Dr. F. H. Bowman, of this firm, is the author of the well-known book upon the cotton fiber, and has lately published a most valuable text book upon the physical sciences for the use of *intermediate* schools and colleges. His scientific attainments, coupled with the practical skill of his brother, which he also shares, may render his practice worth the attention of all spinners. With his consent I submit the following observations which were made in his new mill.

1. The mill is of fireproof construction. The main girders are of cast iron, crossing the mill from side to side between each window at a distance of 10 feet 4 inches from center to center. These girders are of different lengths, resting on the tops of the pillars of cast iron and clasping them round, so that the pillar passed through them forms the base of the pillar for the next story. Five of these beams were required to cross the mill, the average length being about 21 feet. At the junction of each beam iron dogs are cast on to the side over which a wrought iron hoop is shrunk on hot so as to tie the beams together. The tops of the pillars are turned to a true face. The lines of beams are tied together from line to line with wrought iron bars 1½ in. diameter. Between each line of beams a brick arch is turned so that the roof and ceilings are a series of flat arches, and the tops of the arches to the level of the tops of the beam, are filled in with concrete. Spans are laid in this concrete to nail the floor to. In the mill 700 tons of concrete were required for each floor. In the end bays of the mill the arches are turned the other way. Another method will be more fully described hereafter, from the observations made in a mill now in process of construction.

WINDOWS.

2. The windows in use in this, and probably in all the first class mills lately constructed, have no sliding sash, and are glazed with thick, rough, plate glass.

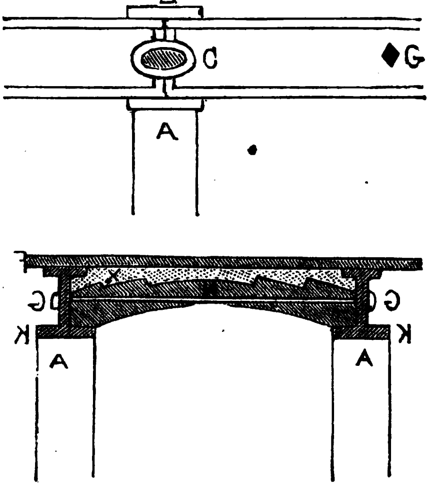
Light No. 1 opens inwardly on an axis at C and D.

Light No. 2 and 3 are fixed.

The rough plate glass costs more than common glass, but is much less liable to be broken. The sash costs less. The ratio of difference would vary in this country, and I therefore obtained no cost statement.

The advantages claimed are that the thick glass retains the heat in winter; that the light, although a little less, is much better diffused;

(the glass has a dingy look outside but within I found the light all that could be desired,) that no shades are needed to keep out the glare of the sun; and that the reduced liability to breakage fully offsets the higher cost of the glass, without reference to the lesser cost of sash.



A—Pillar.
B—Top of Pillar to form base of next floor.
C—Lugs with wrought iron hoops.
G G—Wrought iron tie rods.
K—Brick arch.
X—Concrete.
F—Floor of wood.
K—Section of girder or beam.

An inquiry elsewhere developed the fact that it was somewhat unsafe to use such heavy glass in skylights sloping toward the sun, on account of breaking from expansion. If, however, great care is taken that the glass does not fit too tightly in the frame it may not break. For our climate, however, it would be much safer to set in skylights, or monitors, two thin plates of glass in one sash with an air space between, or to use double windows. In this way only can the condensation of moisture on the inside be prevented. Thin glass may be lightly coated with paint to prevent glare. It would be well for you to visit the one story mechanic art shops of the Institute of Technology, where long skylights are on their trial as a substitute for monitors. The English window seems to be well suited for vertical windows in this country. How far thick plate glass would suffice without a double window remains to be proved. I have asked Prof. Ordway to make some experiments on the non-conducting of heat and the diffusion of light, making use of several varieties of glass in such tests.

ROPE DRIVING.

3. I was surprised to find in this and other first class mills that ropes instead of leather belts have taken the place of the upright shafts and gears which were formerly used.

I can best give the reasons for this practice by submitting the following statement in regard to the "new mill" of the Messrs. Bowman Brothers.

Mill 225 feet long, including rope house; 105 feet wide; 6 stories high; 141,750 feet floor surface, including rope house and stairs, which are outside the wall, containing 60,000 spindles, with room for 20,000 more; all mule spinning and twiners.

One pair compound engines of 1400 indicated horse power, of which 700 horse power are used in the new mill.

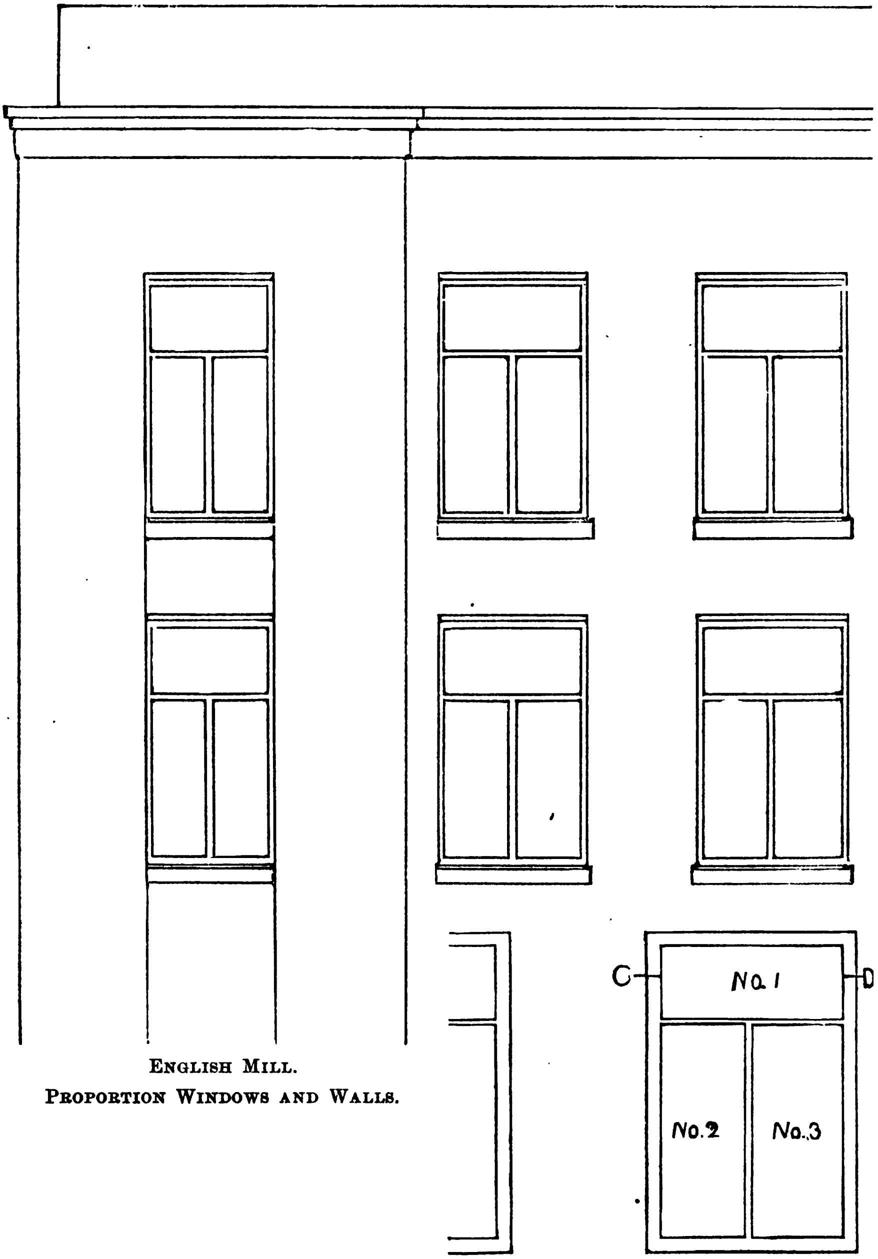
Boilers 8 feet diameter, 30 feet long, 2 flues each, 3 feet ½ inch diameter, steam pressure 80 pounds; 5 boilers are generally in use.

Consumption of fuel, 2¼ pounds Barnsley nuts (bituminous) per indicated horse power; evaporation 9 pounds water to 1 pound coal. Fuel fed by Helix automatic stroker.

The main wheel on the second motion shaft from the engine, or driving pulley, is grooved; it is 12 feet diameter, 104 revolutions per minute, and the power is conveyed to the grooved driven pulleys, which are 7 feet diameter, at 180 revolutions per minute, by 20 ropes.

Engineers differ as to the proper angle of the V shaped grooves.

Ropes are made of best Russia hemp or cotton, cable laid, two inches diameter, running 4320 feet per minute. First cost of ropes is said to be £175, say $875. First cost of leather belts for same service is said to be £1700, say $8500. Weight saved, one-third at least. Power saved, represented by one-third of the weight of belts at 4320 feet per minute. Ropes are sometimes treated with a preparation,



ENGLISH MILL.
PROPORTION WINDOWS AND WALLS.

FOUR FEET WALL.

SIX FEET WINDOW.

sometimes run without, especially the cotton ropes. The wear is of course greater, but it is claimed, on the other hand, that they wear out one at a time, and can be replaced one at once without stopping the mill, during any meal time or in the evening after working hours. These figures were given me by Dr. Bowman.

REMARKS.

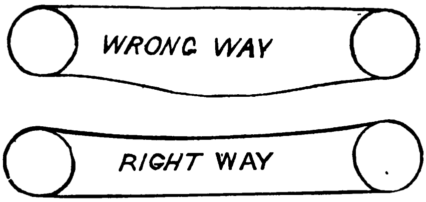
If rope driving should be approved, it would be greatly to the advantage of the underwriter for the following reasons:

1. Almost entire freedom from the danger of water damage.
2. Much less friction on the heavy bearings where most of our destructive friction fires have occurred.
3. Smaller orifices in floors, in mills which have no separate belt or rope rooms.

It may be added that the present tendency in England is toward the substitution of ropes for belts throughout the mills, so far as the substitution is possible.

The rules for rope driving have been given me, as follows:

1. Never use pulleys of less diameter than six feet for main work.
2. The greater the velocity of the rope per minute the greater the efficiency, up to 5000 feet per minute.
3. For great power ropes 2¼ inches diameter, 2 inches when stretched are best; cable laid with 3 strands and each strand of 3 finer strands. Where small power is required it is not necessary to have the rope cable laid, or so great in diameter. For ropes of small diameter smaller diameters of pulleys may be used than 6 feet and cotton ropes are preferable to hemp. For large ropes or outside work hemp is better than cotton. Cotton ropes made from yarn, counts about 20° to 30°, are better than those made from rovings.
4. With a rope 2¼ inches diameter and pulleys above 6 feet, each rope will drive 10 indicated horse power every 1000 feet of rope speed per minute.
5. Whenever circumstances will allow, the slack side of the ropes ought always to be on the top so as to keep the rope tight in the groove where it stretches.



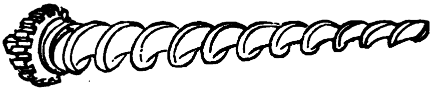
Dr. Bowman says: "There is not much difference in the friction of ropes and belts, but the belts are so much heavier that they take more power to keep in motion, and they cause much more *back lash,* because they get swinging and undulating when at high speed, and are a much greater weight on the neck of the shafts, both driver and driven."

In this connection I may call your attention to the tarred cotton rope and tarred spindle banding prepared by Mr. Thomas H. Dunham, of which I have samples before me. You will observe that while thoroughly impregnated with pine tar they are reasonably supple, perfectly free from stickiness, and are said to be very non-elastic and substantially free from the effects of humidity.

THE HELIX AUTOMATIC STOKER.

4. So far as I have information, but little success has attended the use of automatic stokers in this country, but perhaps the simplicity of this invention may warrant some attention being given to it. The inventor is Michael H. Smith, Crossley street, Halifax, and the patent is held by him.

DRAWING OF THE SCREW.



It is not possible to give an accurate impression of this apparatus without a complete diagram, but it may perhaps suffice to say that three screws, each one like the other, but each varying in size, shape and pitch of screw according to the size of the fire box, are worked in channels below the level of grate bars, which grate bars are placed between and at the sides of the screws; the coal is forced onward and upward by the same revolution, so that the fire is always bright upon the top, and the gases which are distilled in the lower part of the bed of coal are substantially consumed above, so that there is very little smoke from the bituminous coal used. The screws feed the furnace automatically from a hopper in front of the boiler. Small coal only can be used, and coal which does not run in heating.

FIREPROOF FLOORS.

5. The construction of floors of iron and concrete will be described elsewhere, but they are covered with 1½ inch plank; no concrete having yet been found over which "as equable a temperature can be maintained," or "in which dust injurious to bearings can be avoided." Many kinds have been tried, concrete with granite face being best.

OVERHEAD PIPES.

6. The heating pipes in this mill were single pipes, two inches diameter, hung overhead down the center of the mill; the steam is carried into three top stories, and the lower rooms are heated by hot water, which is condensed in these pipes and sent through the lower rooms and is afterward returned to the boiler, or used for washing.

LUBRICATION OF HEAVY BEARINGS.

7. Observing that oil only was used upon main bearings, delivered from oil cups which are furnished with a trip valve delivering a given quantity of oil at each revolution of the shaft, Dr. Bowman assured me that his own experience concurred with Mr. Woodbury's experiments of last winter, of which the results have not yet been published because the work is still incomplete. A preliminary report on this subject is submitted herewith.

The deductions which I refer to are these:

All greases, or semi-solid materials which are used for lubrication, are fit for their purpose only when heated sufficiently to become fluid or oily; that is to say, they must first be converted into oil by heat, and heat is costly and dangerous; and although the cost of greases may be in the ratio of one cent per pound for grease against one dollar per gallon for oil, they are the most expensive lubricants where power is developed at any appreciable cost. The greases must also be condemned as dangerous if this theory is sustained by the experiments which will be continued by Mr. Woodbury next winter.

It is not difficult to test this question upon any main bearing. The method is as follows:

Bore a hole about ½ inch diameter in the cover of the box; in this place a copper case or cartridge resting on the shaft; in this case put water and pack a thermometer; then observe the difference between any grease and a suitable oil. The results of Mr. Woodbury's observations, as far as they were carried, were that greased bearings run at 110° to 180° F., and oiled bearings at 30° to 40° LESS. He used upon our machine Downer's heavy spindle oil, and a mixed oil made by L. B. Squier of New York, and long used by the American Print Works. The one was a little the best lubricant, the other a little more durable; either much safer than any grease, and either much cheaper if the cost of power is considered. The Downer oil was subject to the least evaporation.

THE USE OF THE MICROSCOPE AND POLARISCOPE COMBINED.

8. Dr. Bowman assured me that by applying polarized light to the cotton fiber in a microscope, the injury to each fiber could be visibly traced, and the place designated where the deterioration is accomplished in each process; especially the injury done by heavy weights on the drawing. He also stated that the image showing depreciation could be thrown from a camera upon a sheet with a suitable polariscope, and the photographic image could also be obtained, but he could not describe the methods "without almost writing a treatise on optics." It will be remembered that Dr. Bowman's experiments, given in his book, prove that only about one-fifth to one-fourth of the normal strength of a given number of mature cotton fibers can be found in the best yarn.

My next inspection was given to a mill in process of construction in place of one burned in Bolton. It is to cost five shillings per spindle extra for solidity, strength and fire proof quality. Mill six stories high; 6 feet window space, 4 feet wall on face between windows; walls 42 inches in lower stories; 28 inches upper story; bricks used 9x4 and ½x3 inches, or about twice as large as ours; mill, 128 feet wide, to carry mules of 1050 spindles each, 1⅝ gauge. This is said to be the size of mule which can be operated at least cost; 82,000 spindles, 50's to 120's; 1250 horse power; 28 ropes; iron girders 10 feet 4 inches on centers.

FLOORS.

Between the girders what may be called iron joist are placed midway between the top and under side of the girder,—about 15 inches on centers, 3 inches deep; boards are placed under these joist, to be removed when the concrete hardens, and then 8 inches of coarse concrete is placed, enveloping the cross joist. This concrete is composed of broken bricks and cinders mixed with about one-sixth part of Portland cement.

Over this 3 inches of fine cinder concrete and 1½-inch boards. Wooden joist are set at proper spaces in the 3-inch concrete to which to nail the floor and fasten the machinery. The wooden joist are bedded in concrete made of about six parts ashes to one of *lime*, and are not found to decay. After the concrete is set the boards are removed and the ceiling is scored to hold plastering, and then skimmed and whitened.

By the kindness of John Hetherington & Sons I have obtained since my return the diagram of this mill, which is upon the black board. If you elect to pay the cost of a heliotype of this drawing, it is at your service. The elevation has been made by our Mr. Dabney, to show the ratio of the windows to the wall surface.

As I have stated, this mill will cost more than the average fire-proof mill. As nearly as I could ascertain, an average fire-proof mill now costs 32 shillings per square yard, which is about 90 cents per square foot of floor, including stair spaces and rope spaces. These latter, i. e., rope rooms and stairways, are usually inside the main wall.

I have presented this sketch of a modern fire-proof (so called) English mill, because I think the proportion of wall to window is worth your attention, especially the way in which the top light of the window is carried to the very ceiling between the girders, thus assuring good ventilation and the maximum of light. Except for this top light, rooms 128 feet wide in the clear could not be considered.

On the other hand the roof is bad, and I am satisfied, from investigation since my return, that if the combustible contents of such a mill get well on fire, the building will be destroyed about as surely as if the floors had been made of timber and plank. I am inclined to believe that a floor constructed of heavy timber, three-inch plank, with top floor laid over mortar and ceilings protected with plastering on wire lath, is a safer and more fire-proof mill than one composed solely of brick, concrete and iron, unless every part of the iron is imbedded in or protected by the concrete, which is not the case in this plan. For the alleged danger from fire to the class of mills represented by this plan I have the highest English authority. I had no time while in England to ascertain the facts for myself.

MACHINERY.

Aside from the matters already treated, my attention was especially called to the carding engine of the "Leigh" pattern, perfected in its mechanism, fitted with a revolving apron of top flats, which are stripped and ground as they pass over on the outside, and also fitted with *a saw tooth licker-in*. This latter device was wholly new to me, but I found it was an old invention lately adopted, and now in general use for fine as well as coarse work, the shape of the teeth and the spacing of the saws on the cylinder being varied on Sea Island, Egyptian and American cotton. The saw is made like a band saw, one-quarter inch from back to front of tooth, one-quarter inch from point to point, pitch of teeth like those in use in a splitting saw.

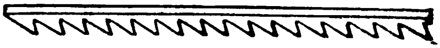


DIAGRAM OF THE SAW—FULL SIZE.

The adaptation of the shape of the tooth to the special staple of the cotton is deemed very important. I understand the saw pictured above to give the shape for medium American staple.

This saw is set as follows: The cylinder is grooved spirally, $\frac{1}{8}$, $\frac{1}{10}$, or $\frac{1}{12}$ inch gauge according to the work, and this saw is wound into the grooves so that the teeth only project. When placed these teeth are far enough away from the feed rolls to avoid cutting the cotton, and the fiber is transferred to the main cylinder, while the leaf and notes are knocked out in a most complete and thorough manner. It has at the first glance a most destructive look, but its very general adoption by the best machinists, and the most skillful spinners, indicates that this appliance works no harm to the staple, and its cleansing effects need no other testimony than the condition of the waste under the cards. Dr. Bowman testified to its great value, even on Sea Island cotton.

In other ways the construction of this revolving top card has been carried to great mechanical perfection. For instance, cylinders made in the shop of Messrs. John Hetherington & Sons, 50 inches diameter and 40 inches face, are first turned and afterward ground to a true surface, and the arches upon which the tops revolve, and by the surface of which they are guided, are then ground to an exact adjustment to the particular cylinder used in that particular engine, by means of a special machine lately patented by the Messrs. Hetherington.

I may here suggest that the English method of stripping cylinders with a revolving brush may be much more effective in cleaning and much less injurious to the card than our common use of hand cards.

Card clothing made of tempered steel wire is coming into use, and is said to be the best. Caution is needed in grinding tempered steel wire on account of sparks, on which account tinned wire is to be preferred. Tinned wire teeth set in a rubber back are also in great measure free from the danger of water damage.

Dronsfield's machine for winding on or mounting card fillets with a uniform tension is doubtless known in this country, and calls for attention.* The Dronsfield Brothers claim to have made improvements in the card grinders also.

It is claimed that the force required to operate fifty of the carding engines named, fifty-inch cylinders, forty inches on face, is two men to attend to strippers and grinding, one lap carrier and two girls to carry cans.

Standard of first-class work on American cotton, 350 lb. to each card in 56½ hours. These cards can, however, be driven up to 600 lb. per week with tolerable results, and will do 500 lb. per week of fair work.

The standard of mule spinning is said to be 27½ hanks warp or 29½ filling per week. English working hours are: 10 hours 5 days, 6½ hours on Saturday, cleaning time included. This gives about 54 hours of actual work per week.

From another source the standard of mule spinning was given at "4 draws in 52 seconds," on No. 32.

For combing machines in the Oldham exhibition the standard is given: "Eight ten-inch laps to one machine; 100 nips per minute; 300 lb. combed in one week." This claim is said not to be sustained in practice, but that a speed of 80 to 90 nips per minute is a fair average. The art of combing has been carried even to combing Madras cotton, one of the shortest of the India staples. In treating this class of cotton the staple is drawn toward the mechanism, which nips it by an air duct.

Roving frames and ring frames have a much heavier look than ours, and I think take more power. The large proportion of engine power provided to run mills devoted to spinning only, without weaving, points in this direction also.

CASE HARDENED ROLLS.

It can hardly be doubted that case hardened fluted rolls, which cannot be cut with a file, and which will stand almost any blow without a dent, must be economical in the long run. They are now furnished at about eight cents per spindle extra price. Here is an example.

A machine invented and made by the Messrs. Hetherington for turning, or rather grinding, off an impaired surface of a leather top roll, is much used.

A varnish is used to give a new and true surface, and some rolls are turned down twice, giving three surfaces in use before they are taken off.

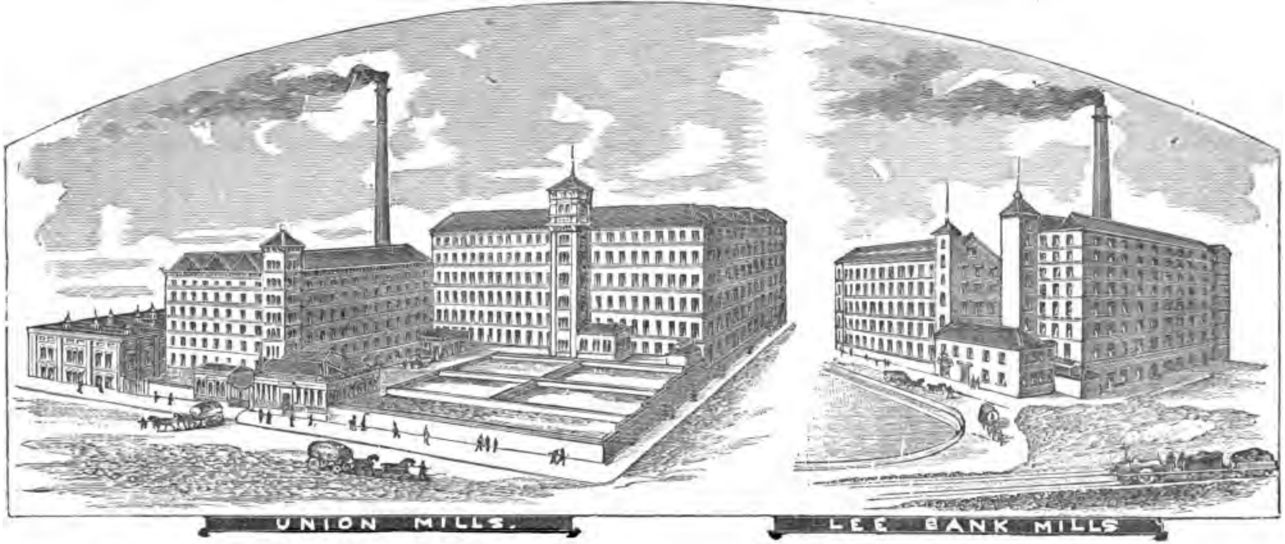
TOP ROLLS WEIGHTED.

I think that among all the spinning frames exhibited at Oldham, comprising examples from nearly every maker in England, not a single one had *covered* middle or back rolls.

The rule appears to be as follows: Back roll iron, self weighted, 2 inches; middle roll iron, self weighted, ⅞ inch; front roll covered,

---

* The Dronsfield machine is used in some of the mills of the United States, and was illustrated in Boston Journal of Commerce, July 30, 1881.



VIEW OF BOWMAN BROTHERS MILL, HALIFAX, ENGLAND.

the rolls on the two sides of the frame being weighted crossway with the same weight· Mules are generally made with all the rolls covered with cloth and leather, where there are two or more ends under each boss, but with a single end to a boss they are usually weighted on the front line only.

Upon combing and drawing frames the Messrs. Hetherington insert a strong spring between the saddle and the weight.

The importance of a uniform adjustment of weights, small grist and light pressure, seems to be fully recognized, and the general use of the coiler with the working up to the drawing frame of a given number of *single* strands, is defended upon the ground that if many strands are carried to a railway head, they are there exposed to a draft upon a heavy grist and under an excessive weight, and that the fibers are impaired thereby.

In general it may be said that during the long battle of the spindles in this country, the attention of Lancashire men has been mainly devoted to selecting, sorting, mixing, cleansing, and preparing cotton for spinning.

On the other hand the ring frames now being constructed, with certain modifications which are claimed to be improvements, appear to be much more perfect in their construction than those with which I was familiar of English construction six years and more since. The extreme perfection of the spindles proper, both in frames and mules, is very noticeable.

From my somewhat hasty observations I should infer that even greater care is now taken than there was six years since, when I visited Lancashire, in selecting, sorting, and mixing cotton, not with the view of using the best, cleanest, and highest priced for common work, but with the object of making the best use of the lower grades, and thus making a sufficiently good yarn at the lowest cost for the cotton.

In the card room the grists are light, and what would be deemed slow speed even here has been adopted. Good, even roving having thus been secured, frames and mules are driven at very high speed.

Your yarn is made or marred before your stock reaches the front roll of the spinning frame, and in the making of good yarn in the card room your English competitors may have stolen a long march upon you while you have been discussing the weight and speed of your spindles. I do not mean to undervalue the improvements in spinning, but the department of sorting, opening, and carding may have been relatively neglected.

OLD HOOPS UTILIZED.

A curious use is made of old cotton bale hoops. They are worked or woven into grids, (so to speak,) and used to hold plastering, as we use wire lathing.

GAS ENGINES.

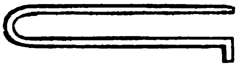
Gas engines appear to be taking the place of steam wherever small powers are wanted. The Otto leads, but the representatives of the Clerk engine claim more continuous and uniform action. The latter is now made, or is about to be made, by the Goodwin Gas Meter Company, 1016 Filbert street, Philadelphia. It is also said to be feasible to use rich oil gas in these engines by the admixture of a large quantity of air at each explosion or stroke.

I submit herewith copies of the Electrician, in which you will find a full account of the progress which has been made in supplying a non-illuminating gas for heating only, or for driving gas engines.

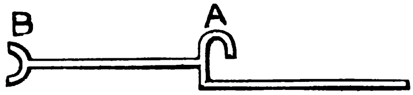
The Economic Motor Company, 28 Beekman street, New York, now offer a gas engine 160 lb. weight, 24 inches high, occupying 13x18 in. floor space, consuming 7 ft. common city gas per hour, *half a man* power, for $75. I know nothing of the merits of their machine, but their proposal is prophetic.

THE LANCASTER MULE—THROSTLE SPINNING FRAME.

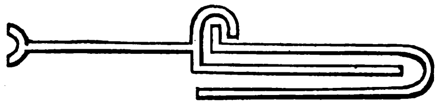
This frame is attracting much attention, but its success has yet to be proved in practice. Very soft yarn is being spun upon it in cop form upon a naked spindle. The cops are built upon a spindle such as is used in a mule, 2¼ inch gauge. The rings are ¾ t 1½ inch. The peculiarity is in the traveler, which serves the purpose of a traveler, and also a purpose like that of a presser on a roving frame. The ring rail is double with a small space between the two sections, and the flange which holds the traveler is vertical. The traveler is made of a thin film of steel.



SECTION OF RAIL.



TRAVELER MUCH MORE THAN THE REAL SIZE.



COMBINATION.

These sections merely give you the leading idea; they are not drawn by any scale.

The thread is carried around the hook of the traveler, A to the yoke B, and is by the latter guided to the cop. A more full description may be found in Cotton, Wool and Iron for Sept. 15 and 22.

Mr. Lancaster was the inventor of the "slowing down" motion on slashers, whereby a beam can be removed without stopping or altering the tension on the warp, and also of many other improvements in manufacturing processes. I am not sure whether or not this slowing motion on the slasher has been introduced in this country or not. I was assured that it is now in common use in England and is considered essential to the best work.

Since my return I have been somewhat amused to learn that a patent had been issued for a spinning frame in which blocks of wood are interposed between sections of the iron frame in order to prevent vibration. You may remember that I made this suggestion when we were discussing spindle bands some years since. In a fine mill in England I found some frames constructed in this way for this very purpose and the owner justified the plan. It may be more necessary there, however, on account of the common use of iron beams in the construction of floors.

PRESERVING TIMBERS.

A method practiced for this purpose is new to me. About three feet from the end of a heavy timber a hole is bored to the center, into which a half inch pipe is forced part way and wedged; creosote is then forced in with a hand pump until the whole end of the timber is filled.

INSURANCE.

Nothing like our mutual system of insurance, combined with inspection and prevention of loss, exists. There is one large mutual insurance company insuring factories and miscellaneous risks as well. Buildings and machinery are insured at different rates, and in many mills each department is insured separately at different rates. These rates are established at a certain tariff with special discounts for special appliances, but these appliances seem to me far less adequate and mostly inferior to our own. From many sources I obtained statements of the rates charged which average abstantially as follows:

On first-class fireproof mills the rate on the mill is about 5 shillings, and on contents 10s. to 12s. 6d. per £100, or 50 to 62½ cents per $100; no rebate or return. On ordinary non-fireproof mills of average grade, 30s. to 40s. per £100, or $1.50 to $2 per $100. On old mills, which are very numerous, £3@£4 per £100, or $3@$4 per $100.

From these outside statements, and from data derived from underwriters, I am satisfied that the average rate on *fair* to *good* non-fireproof mills classed together, is more than *one* per cent., old mills omitted.

I learned one fact from the statistics of a very large insurance company, to wit: That their losses on cotton mills last year were more than 62 per cent. of their premiums, and the average premiums are higher than ours. This is for loss only without expenses; the average expense of English insurance companies is about 30 per cent. of their premiums.

I could get no accurate statistics of the per cent. of loss on risks taken, and no absolute data as to the average rate of premium, but I am fully satisfied that the loss on textile factories is much greater than ours; that it was last year about twice and a half our average, and that the cost of insurance to the assured is nearly three times as great as it is under our system. But this opinion is subject to the reservation that a full examination would have required a long time, and that it is very difficult to get exact data.

I shall give attention to two subjects which I observed in London.

1. The light wooden structures covering a large area, where a fire would expose the Albert Hall and the Kensington Museum to very great danger, were permitted to be built for the Fisheries exhibition, in view of their being protected with a fire-proof paint, which appears to be made of a combination of asbestos and silicate mixed without oil. It appears to be a penetrating and durable wash rather than a paint. It was subjected to the most severe tests before the warrant for the buildings was issued. Since this was written I have received samples and find that this paint consists only of silicate of soda and clay,—good for an inside wash but of no permanent use outside.

2. A new substance just invented was presented to me. It is made of pulp of any kind—old newspapers and the like—converted by chemical treatment into a sort of leather board, which is tough, flexible, apparently durable, very cheap, water proof and substantially proof against sparks or cinders. Belts made of it are run under water.

If these claims can be sustained it is the long-sought suitable covering for a flat roof, but the case is only a *prima facie* one. The treatment was disclosed to me confidentially, and it seems to me that there is a fair chance of success.

WEIGHING SCALE FOR A LAPPER.

The counterbalance consists of a large copper cylinder pierced with holes, into which as much thoroughly dry cotton is placed as is intended to constitute a balance for one feed upon the apron of the breaker lapper. If changes in the atmosphere affect the cotton which is being fed, the cotton in the counterbalance is subject to the same conditions, and therefore the feed is kept up with greater uniformity than if the counterbalance were of metal.

APPARATUS FOR SPINNING A PORTION OF A BROKER'S SAMPLE.

Messrs. J. Hetherington & Sons now make a small set of machinery by means of which a common sample of cotton say of 50 to 100 bales can be converted into yarn and its strength and working qualities can be tested in two hours.

A schedule of this machinery has been furnished me, and is as follows:

VULCAN WORKS, POLLARD STREET,
Estimate. MANCHESTER, Oct. 11, 1883.
FROM JOHN HETHERINGTON & SONS.
TO EDWARD ATKINSON, Esq., Boston.

1 Carding Engine, 40 in. on the wire, with main cylinder 50 in. diameter, doffer 24 in. diameter, taker-in 9 in. diameter, with 105 revolving flats; these flats to be planed on both edges and the elastic bands accurately trued up with our patent truing apparatus, including coiling motion, under-casings of tinned iron, angle bars beneath cylinder and taker-in, circular brush with 4 rows of bristles, pulleys and set-hoops for cleaning the flats. Mote knife with brackets below the taker-in, and taker-in covered with metallic filleting, also Ashworth's patent grinding apparatus for truing up heel of flats.............	$465 00
1 Set of Card Clothing to suit the above card.....	180 00
1 Drawing Frame, 1 head of 2 deliveries, with 4 rows of rollers, 18 in. gauge, coiler and cam revolving motion, back and front stop motions, polished cast iron turn-over clearer flats for stationary cloth, including our patent spring weight hooks for front line of top rollers and single preventer rollers at back	187 00
1 Slubbing Frame of 30 spindles, ¾ in. diameter, 10x5¼ in. bobbin, 3 rows of rollers 20 in. gauge with 4 spindles single centrifugal pressers, including polished cast iron turn-over clearer-flats for stationary cloth, long collars, loose boss top rollers on front line and hand indicators..	531 00
1 Roving Frame of 56 spindles, ⅝ in. diameter, 7x3½ in. bobbin, 3 rows of rollers 20 in. gauge, with 8 spindles, single centrifugal pressers, including polished cast iron turn-over clearer-flats for stationary cloth, long collars, loose boss top rollers on front line and hand indicators.........	565 00
1 Flier Throstle Frames of 32 spindles, 2 in. left, 2⅝ in. gauge or distance from center to center of spindles, 3 rows of drawing rollers, spindles driven by bands from single tin cylinders and creel complete....................	200 00
1 Yarn Tester...	43 00
1 Wrap Reel with scale weights........................	66 00
2 Thermometers, one dry and the other wet bulb, with the printed tables to give the humidity of the air whilst the experiment is being made..	
Total..	$2237 00

The above prices are for delivery f. o. b., Boston, exclusive of duty.

In this connection it may be added that for accurate work it is considered necessary to operate a yarn tester with a steady power—no tests made by operating the machine with the hand being considered of much value.

If the plan for a textile laboratory which I shall present to you is adopted, a complete set of American machinery should be placed alongside such a set of English machinery as is included in the above schedule, and then by accurate observations of the two methods a final determination could be reached as to which is best. I am sure Mr. Draper would never permit an English frame to be set up as an instrument of instruction without putting the best Sawyer frame alongside of it, and I may be permitted to guess that our apparatus for such work as I shall submit to you presently will not cost us very much.

Prof. Lanza proposes to use textile machinery as a part of his apparatus of instruction in the department of mechanical engineering in the Institute of Technology. If a complete set of machines is furnished to the Institute, it occurs to me that the study of cotton and other fibers mechanically and with the microscope, camera etc., together with many experiments in dyeing, drying, etc., may be carried on at the Institute, for which there is little opportunity under the constant working pressure of a mill.

LORD'S FLIER THROSTLE.

Messrs. Lord Brothers have perfected a throstle spinning frame with a light flier fitted for very high speed, some parts of the design based on high speed ring frames. A production of five skeins per day of No. 32 warp is claimed for it, of which I present a sample.

ELECTRIC LIGHTING.

Electric lights have been adopted in factories in much less measure than with us. The art seems to be making little progress because of the incubus of innumerable patents and the failure of an enormous number of speculative companies. It is to be hoped that we may avoid some of the latter dangers, but the speculative advertisements of some of our companies in this section may, perhaps, indicate the usual course, a new crop of victims being apparently ready to swallow any specious bait which is dangled before them under the name of "treasury stock" and other devices for misleading the ignorant or the unwary.

TEXTILE MACHINERY.

An exhibition was opened at Oldham, Aug. 1, to remain open four months, in which I found the most complete collection of cotton machinery I ever saw, and it is said to be the best one ever made.

There is another exhibition at Huddersfield, which contains a full collection of woolen as well as cotton machinery.

In view of the alleged difficulties in obtaining entrance to English mills and works, (which I did not meet,) these two exhibitions offered a most excellent opportunity for the examination of all the latest improvements, which are not kept private or for the use of private owners. One or two such private inventions I was allowed to see, but am not permitted to describe.

I greatly regretted that I had not some one with me at these exhibitions who would have been better qualified to observe minor differences in the details of machines, and who might have observed many points which have probably escaped my notice.

With this I end the subject assigned to me, having recast for your use the report which I made to my directors on the 13th September, which happened to fall into the hands of one of your officers, and brought to me the very flattering request that I would submit it to you.

My observations in Europe and the thoughts which have been suggested in correcting this report for your use have led me to venture upon trying your patience a few minutes longer, in order that I may submit to you a plan for a Textile Laboratory and Museum.

MAY 15 1890
APR 7 1905

578641

JUL 28 '77 H

JUN 23

CANCELLED

GT 4162

LLED

AUG 20 1981